

SGI IRIX

HP StorageWorks Disk Array XP operating system configuration guide

XP48
XP128
XP512
XP1024
XP12000

Fifth edition (November 2004)

part number: A5951-96073

This guide describes the requirements and procedures for connecting the XP family of disk arrays to an SGI IRIX system and configuring the new disk array for operation with SGI IRIX.



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HP StorageWorks Disk Array XP Operating System Configuration Guide: SGI IRIX

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About this guide

This guide describes the requirements and procedures for connecting the XP family of disk arrays to an SGI host system, and configuring the disk array for use with the SGI IRIX operating system.

Intended audience

This guide is intended for system administrators who have knowledge of the following topics:

- Data processing concepts
- Direct access storage device subsystems and their basic functions
- Disk arrays and RAID technology
- Operating system commands and utilities

Disk arrays

Unless otherwise noted, the term *disk array* refers to these disk arrays:

HP Surestore Disk Array XP512
HP Surestore Disk Array XP48
HP StorageWorks Disk Array XP128
HP StorageWorks Disk Array XP1024
HP StorageWorks XP12000 Disk Array

Related documentation

HP provides the following related documentation:

- *HP StorageWorks Disk Array XP128: Owner's Guide*
- *HP StorageWorks Disk Array XP1024: Owner's Guide*
- *HP StorageWorks XP12000 Disk Array: Owner's Guide*

For information about operating system commands and third-party products, refer to the manufacturer's documentation.

Conventions

This guide uses the following text conventions.

| | |
|--|--|
| Figure 1 | Blue text represents a cross-reference. For the online version of this guide, the reference is linked to the target. |
| www.hp.com | Underlined, blue text represents a website on the Internet. For the online version of this guide, the reference is linked to the target. |
| literal | Bold text represents literal values that you type exactly as shown, as well as key and field names, menu items, buttons, file names, application names, and dialog box titles. |
| <i>variable</i> | Italic type indicates that you must supply a value. Italic type is also used for manual titles. |
| <code>input/output</code> | Monospace font denotes user input and system responses, such as output and messages. |
| <i>Example</i> | Denotes an example of input or output. The display shown in this guide may not match your configuration exactly. |
| [] | Indicates an optional parameter. |
| { } | Indicates that you must specify at least one of the listed options. |
| | Separates alternatives in a list of options. |

HP technical support

In North America, call technical support at 1-800-652-6672, available 24 hours a day, 7 days a week.

Outside North America, call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support:

<http://h18006.www1.hp.com/storage/arraysystems.html>

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP storage website

For the most current information about HP StorageWorks XP products, visit the support website. Select the appropriate product or solution from this website:

<http://h18006.www1.hp.com/storage/arraysystems.html>

For information about product availability, configuration, and connectivity, consult your HP account representative.

HP authorized reseller

For the name of your nearest HP authorized reseller, you can obtain information by telephone:

United States 1-800-345-1518

Canada 1-800-263-5868

Or contact: www.hp.com

Revision history

| | |
|---------------|------------------------------|
| May 1999 | First release. |
| November 2000 | Added Fibre Channel support. |
| April 2004 | General update. |
| August 2004 | Technical and format update. |
| November 2004 | Added support for XP12000 |

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Installation

Installation of the HP StorageWorks Disk Array XP is performed by your HP service representative and you. The HP service representative installs the disk array and formats the disk devices. You configure the host server for the new devices with assistance from the HP service representative.

Features and requirements

The disk array and host have the following features and requirements. For details about supported configurations, contact HP.

- HP StorageWorks disk arrays:
 - XP48:** Up to 48 drives from 72 GB to 8.7 TB, 24 FC ports
 - XP128:** From 8 to 128 drives for up to 18 TB, 48 FC ports
 - XP512:** Up to 512 drives from 72 GB to 93 TB, 48 FC ports
 - XP1024:** From 8 to 1024 drives for up to 149 TB, 64 FC ports
 - XP12000:** Up to 1152 drives for up to 165 TB, 128 FC ports
- SGI ORIGIN 2000 system(s)
- SGI IRIX operating system: XP1024 systems support only IRIX versions 6.5.13f, 6.5.16f, 6.5.22f, and 6.5.23; XP12000 systems support only version 6.5.24 and higher.
- Host Bus Adapters (HBAs): Install adapters and all utilities and drivers. Refer to the adapter documentation for installation details.
- *(Recommended)* HP StorageWorks Command View XP with LUN management feature or Remote Control with LUN Configuration Manager XP option for configuring disk array ports and paths.
- *(Recommended)* HP StorageWorks Secure Manager XP: Allows the host to access only array devices for which it is authorized.
- Other available XP Software (some may not apply to your system):
 - HP StorageWorks Business Copy XP
 - HP StorageWorks Continuous Access XP
 - HP StorageWorks Continuous Access Extension XP
 - HP StorageWorks Auto LUN XP
 - HP StorageWorks Continuous Track XP
 - HP StorageWorks Data Exchange XP
 - HP StorageWorks Resource Manager XP
 - HP StorageWorks RAID Manager XP
 - HP StorageWorks Cache LUN XP
 - HP StorageWorks Auto Path XP
 - HP StorageWorks Cluster Extension XP
 - HP StorageWorks Performance Advisor XP software

Fibre Channel interface

The XP48, XP128, XP512, XP1024, and XP12000 disk arrays support these 1 Gbps and 2 Gbps Fibre Channel interfaces:

- Short-wave non-OFC (open fiber control) optical interface
- Multimode optical cables with SC or LC connectors
- Public or private arbitrated loop (FC-AL) or fabric direct attach
- Fibre Channel switches

Even though the interface is Fibre Channel, this guide uses the term “SCSI disk” because disk array devices are defined to the host as SCSI disks.

Device types

The disk arrays support the following device emulation types:

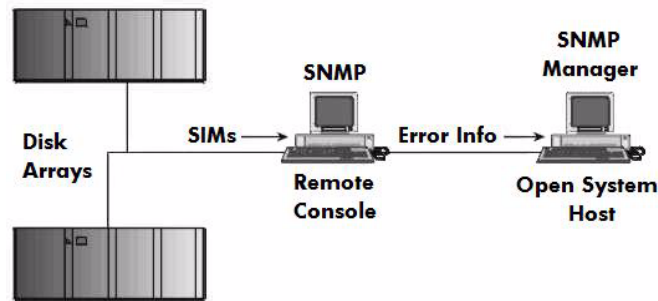
- **OPEN-x devices:** OPEN-x logical units represent disk devices. Except for OPEN-V, these devices are based on fixed sizes. OPEN-V is a user-defined size. Supported emulations include OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V devices.
- **LUSE devices (OPEN-x*n):** Logical Unit Size Expansion (LUSE) allows you to combine 2 to 36 OPEN-x devices to create expanded LDEVs larger than standard OPEN-x disk devices. For example, an OPEN-x LUSE volume created from ten OPEN-x CVS volumes is designated as OPEN-x*10.
- **CVS devices (OPEN-x CVS):** Volume Size Configuration (VSC) defines custom volumes (CVS) that are smaller than normal fixed-sized logical disk devices (volumes). (OPEN-V is a CVS-based custom disk size that you determine. OPEN-L does not support CVS.)
- **LUSE (expanded) CVS devices (OPEN-x*n CVS):** LUSE CVS combines CVS devices to create an expanded device. This is done by first creating CVS custom-sized devices and then using LUSE to combine from 2 to 36 CVS devices. For example, if three OPEN-9 CVS volumes are combined to create an expanded device, this device is designated as OPEN-9*3-CVS.

Failover

The disk arrays support many standard software products that provide host, application, or I/O path failover and logical volume (storage) management.

SNMP configuration

The disk arrays support standard Simple Network Management Protocol (SNMP) for remotely managing the disk array from the host. The SNMP agent on the remote console PC or Command View can provide status and Remote Service Information Message (R-SIM) reporting to the SNMP manager on the host for up to eight disk arrays. To configure the SNMP manager on the host, refer to the operating system documentation.



RAID Manager command devices

RAID Manager manages Business Copy (BC) and/or Continuous Access (CA) operations from a server host. To use RAID Manager with BC or CA, you must use Command View or LUN Configuration Manager to designate at least one LDEV as a command device. Refer to the Command View or LUN Configuration Manager user guide for information about how to designate a command device.

Installation procedures

The HP representative and you perform the following procedures:

1. [“Install and configure the disk array” on page 16](#)
 - “Setting the system option mode”
 - “Configuring the Fibre Channel ports”
 - “Setting the Host Mode for the disk array ports”
2. [“Install and configure the host” on page 20](#)
 - “Loading the OS and software”
 - “Installing and configuring the HBAs”
 - “Clustering and Fabric zoning”
 - “Fabric zoning and LUN security for multiple operating systems”
3. [“Connect the disk array” on page 23](#)
 - “Defining the paths”
 - “Verifying new device recognition”
4. [“Configure disk array devices” on page 26](#)
 - “Create device files”
 - “Partition and label the devices”
 - “Enable command tag queuing”
 - “Create the file systems”
 - “Create and verify the mount directories”
 - “Register, mount, and verify the file systems”

Install and configure the disk array

The HP service representative performs the following tasks:

- Assembling hardware and installing software
- Loading the microcode updates
- Installing the channel adapters (CHAs) and cabling
- Installing and formatting devices

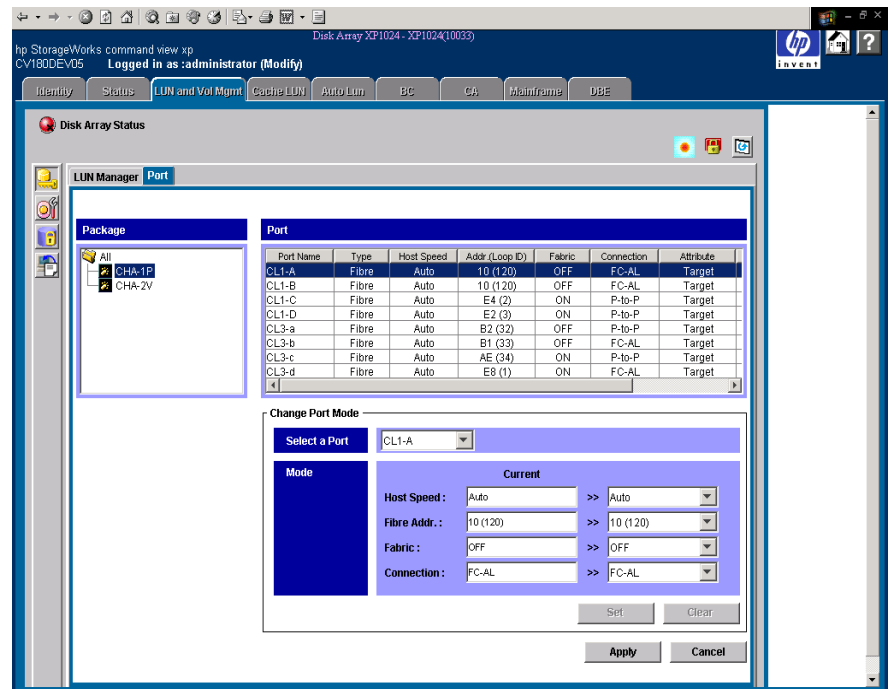
You perform the additional tasks below. If you do not have Command View or LUN Configuration Manager, your HP service representative can perform these tasks for you.

Setting the system option mode

The HP representative sets the System Option Mode based on the operating system and software configuration of the host.

Configuring the Fibre Channel ports

Configure the disk array Fibre Channel ports by using Command View (shown) or the Fibre Parameter window in LUN Configuration Manager. Select the settings for each port based on the device to which the port is connected (fabric switch or point-to-point connection). Use switch zoning, if you connect different types of hosts to the array through the same switch.

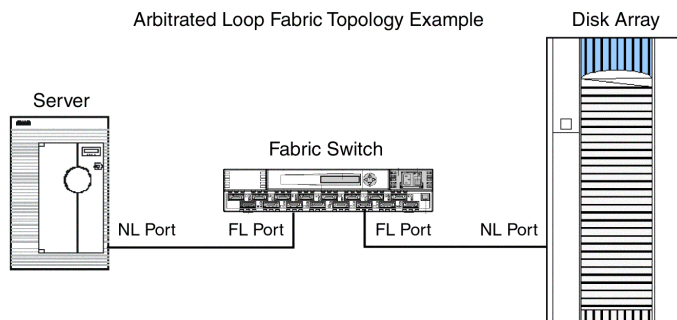
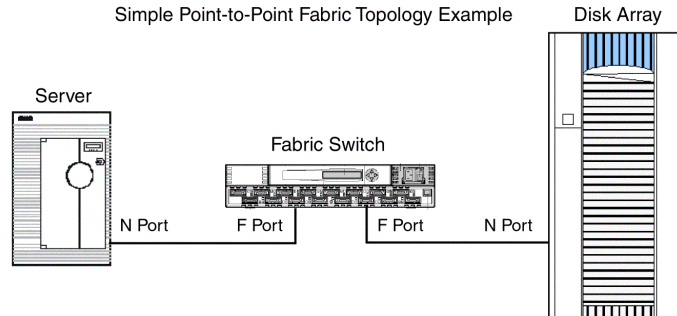


Fibre Address

In fabric environments, the port addresses are assigned automatically. In arbitrated loop environments, you set the port addresses by selecting a unique arbitrated loop physical address (AL-PA) or loop ID for each port.

Fabric and Connection parameter settings

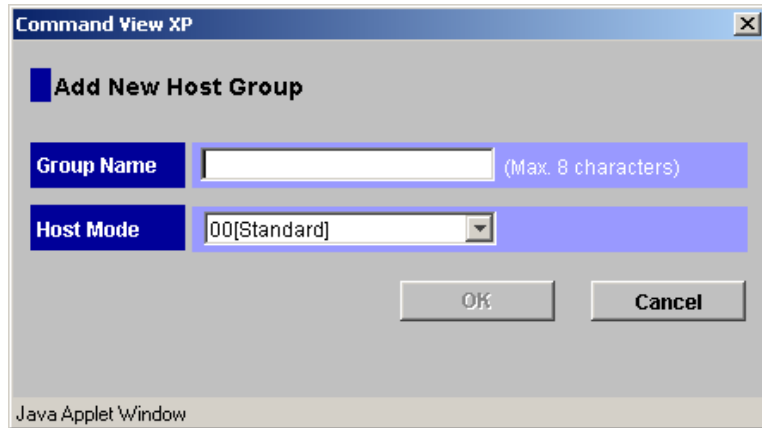
You can set each array port to FABRIC ON or OFF with connections of POINT-TO-POINT or FC-AL as shown in the following table and figures. For detailed topology information, refer to the *HP StorageWorks SAN Design Reference Guide* on the hp.com website.



| Fabric Parameter | Connection Parameter | Provides |
|------------------|----------------------|---|
| ON | FC-AL | Not supported |
| ON | Point-to-Point | F-port (fabric port) |
| OFF | FC-AL | AL-port (private arbitrated loop; direct connect without a SAN) |
| OFF | Point-to-Point | Not supported |

Setting the Host Mode for the disk array ports

The disk array ports have Host Modes that you must set depending on the host you use. After the disk array is installed, use Command View (shown) or LUN Configuration Manager to set the Host Mode for each port.



The host mode setting for SGI IRIX is **00**.

Install and configure the host

Install and configure the host and host bus adapters (HBAs) that connect the host to the disk array.

Loading the OS and software

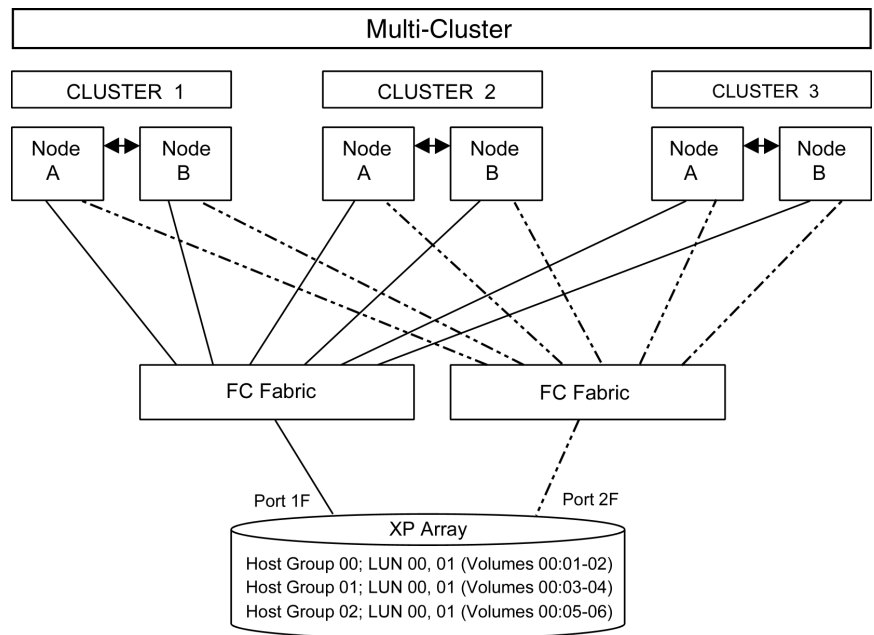
Follow the manufacturer's instructions to load the operating system and software onto the host. Load all OS patches and configuration utilities supported by HP and the HBA manufacturer.

Installing and configuring the HBAs

Install and configure the host bus adapters using the HBA manufacturer's instructions.

Clustering and Fabric zoning

If you plan to use clustering, install and configure the clustering software on the servers. Note that the XP1024 array supports clustering, but the XP12000 array does not support it. Clustering is the organization of multiple servers into groups. Within a cluster, each server is a node. Multiple clusters compose a multi-cluster environment. The following example shows a multi-cluster environment with three clusters, each containing two nodes. The nodes share access to the disk array.



Within the Storage Area Network (SAN), the various clusters may be homogeneous (same operating system) or they may be heterogeneous (mixed operating systems). How you configure LUN Security and fabric zoning depends on the operating system mix and the SAN configuration.

Fabric zoning and LUN security for multiple operating systems

By using appropriate zoning and LUN security, you can connect multiple clusters of various operating systems to the same switch and fabric:

- Host zones must contain only homogeneous operating systems.
- Storage port zones may overlap if more than one operating system needs to share an array port.
- Heterogeneous operating systems may share an XP array port if you use Secure Manager and set the appropriate host group and mode; all others must connect to a dedicated XP array port.
- Use Secure Manager for LUN isolation when multiple hosts connect through a shared array port. Secure Manager provides LUN security by allowing you to restrict which LUNs each host can access.

| Environment | OS Mix | Fabric Zoning | LUN Security |
|--------------------------------|--|---------------|--|
| Standalone SAN (non-clustered) | homogeneous (a single OS type present in the SAN) | Not required | Must be used when multiple hosts connect through a shared port |
| | heterogeneous (more than one OS type present in the SAN) | Required | |
| Clustered SAN | homogeneous (a single OS type present in the SAN) | Not required | Must be used when multiple cluster nodes connect through a shared port |
| | heterogeneous (more than one OS type present in the SAN) | Required | |
| Multi-Cluster SAN | homogeneous (a single OS type present in the SAN) | Not required | Must be used when multiple cluster nodes connect through a shared port |
| | heterogeneous (more than one OS type present in the SAN) | Required | |

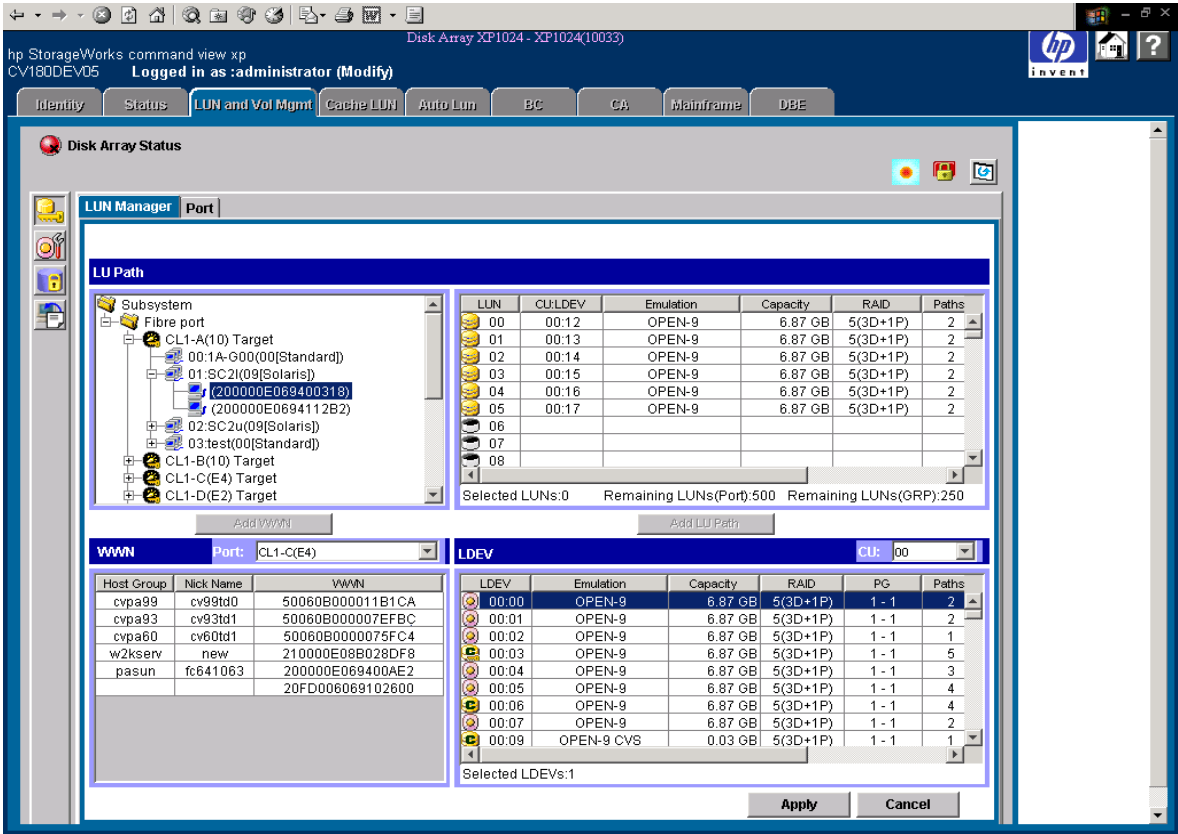
Connect the disk array

Connect the disk array to the host as follows:

1. The HP service representative verifies operational status of the disk array channel adapters, LDEVs, and paths.
2. The HP representative connects the Fibre Channel cables between the disk array and the host.
3. Verify the ready status of the disk array and peripherals.

Defining the paths

Use Command View (shown) or LUN Configuration Manager to map paths between ports and volumes within the disk array. The paths (LUNs) you create provide the host access to array devices. For detailed instructions, refer to the Command View or LUN Configuration Manager user guide. Write down the LUNs for later use in configuring or verifying the host.



Verifying new device recognition

To verify the system recognizes the devices on the newly installed disk array:

1. Power on the system.
2. Log in to the system as **root**.
3. Generate a file containing peripheral device information; enter:
`# hinv -v > /tmp/hinv.info`
4. Display peripheral device information; enter:
`# more /tmp/hinv.info`
5. Verify that all new devices on the disk array are listed.

Configure disk array devices

Configure the disk array devices in the same way you would configure any new disk on the host. Creating scripts to configure all devices at once may save you considerable time.

1. **For UNIX systems, configuring devices typically requires these steps:** Create device files if they were not created automatically.
2. Partition, and label each device.
3. Set command tag queueing.
4. Create a file system for each device.
5. Create a mount directory for each device.
6. Register each device in the mount table.
7. Verify the devices auto-mounted.
8. Verify file system operation by copying a file to each device.

Create device files

The SGI IRIX system creates device files for new devices automatically during server startup.

The SGI IRIX uses the following formats for the device file names.

- Parallel SCSI and FC-AL

```
/dev/rdsk/dkscontroller#ddrive#{spartition#|vh|vol}  
/dev/rdsk/dkscontroller#ddrive#llun#{spartition#|vh|vol}  
/dev/dsk/dkscontroller#ddrive#spartition#  
/dev/dsk/dkscontroller#ddrive#
```

Example

```
/dev/rdsk/dks8d0l8s0
```

- Fibre Channel fabric

```
/dev/rdsk/nodename/llunlun#{spartition#|vh|vol}/ccontroller#pport#  
/dev/dsk/nodename/llunlun#spartition#/ccontroller#pport#
```

Example **/dev/rdsk/50000e10ff809999/lun1vol/c8p50000e10ff809999**

The fabric device names always specify the logical unit number (*lunlun#*), even when it is zero. The **rdsk** devices use a raw interface to communicate with the disk, and the **dsk** devices use a block interface.

The *ccontroller#*, *ddrive#*, and *llun#* parameters indicate the SCSI controller number, target ID, and logical unit number.

The *pport#* and *nodename* parameters are used to indicate the worldwide name (WWN) and the device port number (Fibre Channel disks have two ports). The **vh** and **vol** devices are in the **rdsk** directory only, because they are normally used only for **ioctl** and raw access.

Fabric switch

When the fabric switch is used, the WWN information is displayed by the **nsShow** command. The PortName (column 4) is the WWN, and the NodeName is the device port number.

Example

```
switch:admin> nsShow
The Local Name Server has 7 entries {
Type Pid   COS      PortName                               NodeName                               TTL(sec)
*N  011200;  2,3;10:00:00:60:69:00:ab:ba;10:00:00:60:69:00:ab:ba; 60
   FC4s: FCIP
N  021200;  2,3;10:00:00:60:69:00:03:19;30:00:00:60:69:00:03:19; na
   FC4s: FCIP
NL 021300;  3;10:00:00:60:69:00:02:d6;20:00:00:60:69:00:02:d6; na
   FC4s: FCP [STOREX RS2999FCPH3 MT09]
NL 0214e2;  3;21:00:00:fa:ce:00:21:1e;20:00:00:fa:ce:00:21:1e; na
   FC4s: FCP [STOREX RS2999FCPH3 CD09]
NL 0214e4;  3;21:00:00:fa:ce:00:21:e1;20:00:00:fa:ce:00:21:e1; na
   FC4s: FCP [STOREX RS2999FCPH3 NS09]
NL 0214e8;  3;21:00:00:fa:ce:04:83:c9;20:00:00:fa:ce:04:83:c9; na
   FC4s: FCP [STOREX RS2999FCPH3 JB09]
Used as WWN on IRIX
NL 0214ef;  3;21:00:00:ad:bc:04:6f:70;20:00:00:ad:bc:04:6f:70; na
   FC4s: FCP [STOREX RS2999FCPH3 ]
}
```

To create the device files:

1. Go to the **/dev** directory; enter:

```
# cd /dev
```

2. Create the device files; enter:

```
# ./MAKEDEV dks
```

The system creates device files for each disk device recognized.

Example

```
# cd /dev
# ./MAKEDEV dks
    find dsk rdsd \( -name 'dks*d*s[0167]*' -o -name 'dks*d*s15*' \
    -o -name 'dks*d*vol*' -o -name 'dks*d*vh*' \) -print | xargs rm
-rf
    umask 077; \
    B_DKS=128; C_DKS=128; \
    B_RAD=176; C_RAD=176; \
    export B_DKS C_DKS B_RAD C_RAD; \
    for NAME in `ls -l MAKEDEV.d/DKS_* | grep -v '\.[ON]$'` ; do \
        $NAME ; \
    done
```

3. To verify that the system has created the device files correctly, go to the **/dev/dsk** directory; enter:

```
# cd /dev/dsk
```

4. List the device files; enter:

```
# ls -l
```

You may want to restrict the display to find only the new devices rather than all devices. For example, to list only the disk devices on controller number 4, enter:

```
# ls -l dks4d*
```

Example

```
# cd /dev/dsk
# ls -l dks4d*
brw----- 1 root sys 128,1088 Apr 7 12:18 dks4d4s0
brw----- 1 root sys 128,1089 Apr 7 12:18 dks4d4s1
brw----- 1 root sys 128,1103 Apr 7 12:18 dks4d4s15
brw----- 1 root sys 128,1095 Apr 7 12:18 dks4d4s7
#
```

5. Go to the **/dev/rdsd** directory; enter:

```
# cd /dev/rdsd
```

6. List the device files; enter:

```
# ls -l
```

Example

```
# cd /dev/rdsd
# ls -l dks4d*
crw----- 1 root sys 128,1088 Apr 7 12:18 dks4d4s0
crw----- 1 root sys 128,1089 Apr 7 12:18 dks4d4s1
crw----- 1 root sys 128,1103 Apr 7 12:18 dks4d4s15
crw----- 1 root sys 128,1095 Apr 7 12:18 dks4d4s7
```

You can restrict the display to find only the new devices rather than all devices. For example, to list only the disk devices on controller number 4, enter:

```
# ls -l dks4d*
```

Partition and label the devices

After new device recognition has been verified, partition the new SCSI disk devices using the **fx** utility. When the disk array is connected through a fabric switch, you must specify the device file when starting the **fx** utility. After setting the partitions for a device, verify the partitions using the **prtvtoc** command.

The IRIX system controls disk devices using partitions. One LUN can be divided into a maximum of sixteen partitions (primary partition 0 through 15). The maximum capacity per partition is not limited. Partitions 8 (vh) and 9 are reserved and are used for storing disk management information. Partition 10 is also reserved. Therefore, the number of available partitions per device is thirteen (0 to 7 and 11 to 15).

Caution *Do not partition or label the Data Exchange (DE) devices. This will prevent the DE software from accessing the device. These devices must be installed and accessed as raw devices.*

To partition and label the devices:

1. Use the **fx** utility to create and label the partitions for each new OPEN-x logical unit.

Example

```
# fx -x
fx version 6.5, Jul 11, 1999
Press Enter to label a disk.fx: "device-name" = (dksc)
Enter the SCSI controller #.fx: ctrlr# = (0) 8
Enter the SCSI TID.fx: drive# = (1) 0
Enter the LUN #.fx: lun# = (0) 15
...opening dksc(8,0,15)
...drive selftest...OK
Scsi drive type == HITACHI          OPEN-3          5244

----- please choose one (? For help, .. to quit this menu)-----
[ex]it          [d]ebug/          [l]abel/          [a]uto
[bl]adblock/    [ex]e|rcise/        [r]epartition/
Enter r for partition menu.          fx> r

----- partitions-----
part  type          blocks          Megabytes    (base+size)
  0:  xfs          266240 + 2048000      130 + 1000
  1:  xfs          2052096 + 2048000    1002 + 1000
  8:  volhdr           0 + 4096           0 + 2
 10:  volume           0 + 4806720         0 + 2347

capacity is 4806720 blocks
----- please choose one (? for help, .. to quit this menu)-----
[r]o|otdrive    [o]ptiondrive    [e]xpert
[u]srrootdrive  [r]e|size
Enter e for expert menu.fx/repartition> e
```

Warning: you will need to re-install all software and restore user data from backups after changing the partition layout. Changing partitions will cause all data on the drive to be lost. Be sure you have the drive
Enter **y** to continue.backed up if it contains any user data. Continue? **y**
Enter **..** when done

Enter partition number.fx/repartition/expert: change partition = (0) **0**
before: type xfs block 266240, 130 MB
len: 4540416 blks, 2217 MB
Enter partition type.fx/repartition/expert: partition type = (xfs) **xfs**
Enter min partition size.fx/repartition/expert: base in megabytes = (130) **2**
Enter max partition size.fx/repartition/expert: size in megabytes (max 2347) = (2217) **1024**
after: type xfs block 4096, 2 MB
len: 2097152 blks, 1024 MB

Enter partition number.fx/repartition/expert: change partition = (1) **1**
before: type xfs block 4096, 2 MB
len: 262144 blks, 128 MB
Enter partition type.fx/repartition/expert: partition type = (xfs) **xfs**
Enter min partition size.fx/repartition/expert: base in megabytes = (2) **1026**
Enter max partition size.fx/repartition/expert: size in megabytes (max 1323) = (128) **1024**
after: type xfs block 2097152, 1024 MB
len: 2097152 blks, 1024 MB

Enter partition number.fx/repartition/expert: change partition = (2) **2**
before: type xfs block 0, 0 MB
len: 0 blks, 0 MB
Enter partition type.fx/repartition/expert: partition type = (xfs) **xfs**
Enter min partition size.fx/repartition/expert: base in megabytes = (0) **2050**
Enter max partition size.fx/repartition/expert: size in megabytes (max 299) = (0) **297**
after: type xfs block 4194304, 2048 MB
len: 608256 blks, 297 MB

:
:
:
:

----- partitions-----

| part | type | blocks | Megabytes | (base+size) |
|------|--------|-------------------|-------------|-------------|
| 0: | xfs | 0 + 2097152 | 2 + 1024 | |
| 1: | xfs | 2097152 + 2097152 | 1026 + 1024 | |
| 3: | xfs | 4194304 + 608256 | 2050 + 297 | |
| 8: | volhdr | 0 + 4096 | 0 + 2 | |
| 10: | volume | 0 + 4806656 | 0 + 2347 | |

capacity is 4806656 blocks

----- please choose one (? for help, .. to quit this menu)-----
[r]otdrive [o]ptiondrive [e]xpert
[u]srrrootdrive [r]size

Enter **..** to quit menu.fx/repartition> **..**

----- please choose one (? for help, .. to quit this menu)-----
[exi]t [d]ebug/ [l]abel/ [a]uto
[b]adblock/ [ex]rcise/ [r]epartition/
Exit the fx utility.fx>**exi**
#

Caution *Do not change partitions 8, 9, or 10. Set the partitions (except partition 10) so as not to partition on top of another partition. Because partition 8 usually uses parts between 0 and 6, set the base of the first partition to 6.*

Fibre Channel

For connecting to a fabric switch, specify the device file directly:

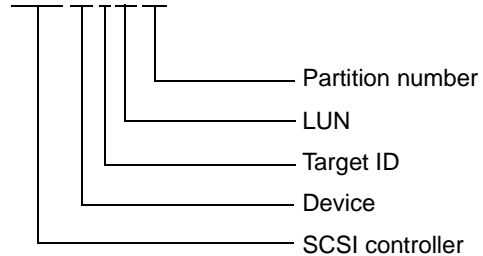
```
# fx -x -d /dev/rdisk/50000e10ff809999/lun2vol/c8p50000e10ff809999
fx version 6.5, Jan 11, 2000
...opening /dev/rdisk/50000e10ff809999/lun2vol/c8p50000e10ff809999
...drive selftest...OK
Scsi drive type == HITACHI          OPEN-3          5245

----- please choose one (? for help, .. to quit this menu)-----
[ex]lt          [d]ebug/          [l]abel/          [a]uto
[b]adblock/     [ex]ercise/       [r]epartition/

fx> r
```

2. Use the **prtvto** command to verify the partition configuration.

```
# prtvtoc /dev/dsk/dks8d0115s0
```



Enable command tag queuing

SCSI command tag queuing must be enabled to optimize the performance of the disk array devices. Because command tag queuing is disabled by default in IRIX, you must enable it and set the queue depth for each disk array logical device (including Data Exchange devices) using the **fx** utility.

| Parameter | Required Value |
|----------------------|----------------|
| Queue depth per LU | ≤8 |
| Queue depth per port | ≤256 |

You can adjust the queue depth for the disk array devices later as needed (within the specified range) to optimize the I/O performance of the disk array devices.

To enable command tag queuing and set the queue depth for the disk array devices:

1. Start the **fx** disk utility and select the desired device to configure.
2. When the device is selected and the **fx>** prompt reappears, enter **/label/set/para** to set the command tag queuing and queue depth options.
3. When prompted, enter **enable** to enable command tag queuing, and enter the desired command tag queuing depth (for example, **8**).
4. When prompted, enter **yes** to modify the drive parameters as specified.
5. Exit the **fx** utility, and enter **yes** to write out (save) the changes to the drive parameters.
6. Repeat steps 1 through 5 for each disk array disk device, including OPEN-x, CVS, LUSE, and Data Exchange devices.

Example

```
# fx -x "dksc(8,0,2)"
fx version 6.5, Jan 11, 2000
...opening dksc(8,0,2)
...drive selftest...OK
fx: Warning:  invalid label from disk driver, ignored
Scsi drive type == HITACHI      OPEN-3-CVS      5244
...creating default bootinfo
...created default partitions, use /repartition menu to change
...creating default volume directory
```

```

----- please choose one (? for help, .. to quit this menu)-----
[exi]t          [d]ebug/          [l]abel/          [a]uto
[b]adbblock/    [ex]rcise/        [r]epartition/

Set the device parameters.fx> /label/set/param
fx/label/set/parameters: Error correction = (enabled)
fx/label/set/parameters: Data transfer on error = (enabled)
fx/label/set/parameters: Report recovered errors = (enabled)
fx/label/set/parameters: Delay for error recovery = (enabled)
fx/label/set/parameters: Err retry count = (0)
fx/label/set/parameters: Transfer of bad data blocks = (disabled)
fx/label/set/parameters: Auto bad block reallocation (write) = (enabled)
fx/label/set/parameters: Auto bad block reallocation (read) = (enabled)
fx/label/set/parameters: Read ahead caching = (enabled)
fx/label/set/parameters: Write buffering = (enabled)
fx/label/set/parameters: Drive disable prefetch = (0)
fx/label/set/parameters: Drive minimum prefetch = (0)
fx/label/set/parameters: Drive maximum prefetch = (0)
fx/label/set/parameters: Drive prefetch ceiling = (0)
Enter enable.fx/label/set/parameters: Enable CTQ = (disabled) enable
Enter desired queue depth.fx/label/set/parameters: CTQ depth = (2) 8
fx/label/set/parameters: Read buffer ratio = (0/256)
fx/label/set/parameters: Write buffer ratio = (0/256)
* * * * * W A R N I N G * * * * *
Enter yes.about to modify drive parameters on disk dksc(8,0,2)! ok? yes

----- please choose one (? for help, .. to quit this menu)-----
[exi]t          [d]ebug/          [l]abel/          [a]uto
[b]adbblock/    [ex]rcise/        [r]epartition/
Exit the fx utility.fx> exi

Enter yes.label info has changed for disk dksc(8,0,2). write out changes? (yes)
yes

```

Create the file systems

Create a file system for each new OPEN-x device.

To overcome the size and speed limitations of a standard file system (EFS), you may choose to create an extended file system (XFS).

The EFS file system creates one file system of 2 GB or less on a single device without the extended logical volume manager (XLV). The XFS file system creates a 64-bit file system capable of scaling to handle extremely large files and file systems. The file system is application dependent.

If you are not sure which file system is best, contact the HP support center.

To create an EFS file system:

1. Use the **mkfs** command to create an EFS file system.

Example

For example, to create a file system for controller 4, drive 4, logical unit 3, partition 7, enter:

```
# mkfs /dev/rdisk/dks4d4l3s7
```

2. Repeat step 1 for each EFS file system to be created.

The character device file for this device is found under **/dev/rdisk**.

To create an XFS file system:

1. Use the **mkfs** command to create an XFS file system. For example, to create a file system for controller 4, drive 4, logical unit 3, partition 7, enter:

```
# mkfs xfs -d name=/dev/rdisk/dks4d4l3s7 -b size=1k -l internal,size=10m
```

2. Repeat step 1 for each XFS file system to be created.

Create and verify the mount directories

Caution *Do not create mount directories for multiplatform devices.*

To create and verify the mount directories:

1. Create a mount directory by using the **mkdir** command.

Example For example, to create a mount directory for logical unit 0 on the disk array, partition c, enter:

```
# mkdir HP5700_LU0c
```

2. Verify the new mount directories by using the **ls -d** command.

Example

```
# ls -d /HP5700*
drwxr-xr-x 2 root sys 9 May 22 13:53 /disk13
drwxr-xr-x 2 root sys 9 Sep 10 1996 /disk4
drwxr-xr-x 2 root sys 9 May 22 13:46 /disk412
drwxr-xr-x 2 root sys 9 May 22 13:49 /disk413
drwxr-xr-x 2 root sys 9 May 22 13:55 /disk48
drwxr-xr-x 2 root sys 9 Sep 11 1996 /disk5
drwxr-xr-x 2 root sys 9 Oct 10 1996 /disk52
drwxr-xr-x 2 root sys 9 Oct 7 1996 /disk53
drwxr-xr-x 2 root sys 9 Oct 7 1996 /disk531
drwxr-xr-x 2 root sys 9 Sep 13 1996 /disk54
drwxr-xr-x 2 root sys 9 Sep 13 1996 /disk541
drwxr-xr-x 2 root sys 9 Sep 13 1996 /disk542
drwxr-xr-x 2 root sys 9 Sep 18 1996 /disk543
:
:
#
```

3. Repeat steps 1 and 2 for each device on the disk array.

Register, mount, and verify the file systems

To register the new file systems in the mount table:

- 1. Make a backup copy of the mount table; enter:
`# cp /etc/fstab /etc/fstab.backup`
- 2. Edit the file `/etc/fstab` by using the `vi` editor.

Example

```
# cp /etc/fstab /etc/fstab.backup
# vi /etc/fstab
/dev/root / xfs rw,raw=/dev/rroot 0 0
/dev/dsk/dks5d4s7 /disk54 efs rw,raw=/dev/rdsk/dks5d4s7 0 0
/dev/dsk/dks5d411s7 /disk541 efs rw,raw=/dev/rdsk/dks5d411s7 0 0
/dev/dsk/dks5d412s7 /disk542 efs rw,raw=/dev/rdsk/dks5d412s7 0 0
/dev/dsk/dks5d413s7 /disk543 efs rw,raw=/dev/rdsk/dks5d413s7 0 0
/dev/dsk/dks5d414s7 /disk544 efs rw,raw=/dev/rdsk/dks5d414s7 0 0
/dev/dsk/dks4d4s7 /HP5700_LU0 efs rw,raw=/dev/rdsk/dks4d4s7 1 2
/dev/dsk/dks4d411s7 /HP5700_LU1 efs rw,raw=/dev/rdsk/dks4d411s7 1 2
/dev/dsk/dks4d412s7 /HP5700_LU2 efs rw,raw=/dev/rdsk/dks4d412s7 1 2
/dev/dsk/dks4d413s7 /HP5700_LU3 efs rw,raw=/dev/rdsk/dks4d413s7 1 2
```

| 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|
| ① | Device to mount (device file name). | | | | |
| ② | Mount point (mount directory). | | | | |
| ③ | File system. | | | | |
| ④ | Mount options (usually [rw,noquota]). | | | | |
| ⑤ | Enhance: enter 0 for disk array devices. | | | | |
| ⑥ | fsck pass: order in which FS checks are to be performed. Add a line in the file for each new file system. | | | | |

Example To register an EFS file system for the device at controller 4, disk 4, LUN 3, slice 7, mounted on the `/HP5700_LU0` directory, enter:

```
/dev/dsk/dks4d413s7 /HP5700_LU0 xfs
rw,raw=/dev/rdsk/dks4d413s7 1 2
```

To register an XFS file system for the device at controller 4, disk 4, LUN 3, slice 7, mounted on the `/HP5700_LU0` directory, enter:

```
/dev/dsk/dks4d413s7 /HP5700_LU0 xfs
rw,raw=/dev/rdsk/dks4d413s7 1 2
```

3. When you are finished adding the new file systems to the mount table, save the changes and exit the **vi** editor.
4. Verify that the new file systems are registered correctly; enter:

df

Example

```
# df
File system          Type  blocks      use      avail  %use Mounted on
/dev/root             xfs   1852624    1038184    814440    57  /
/dev/dsk/dks4d4s7     efs    4659286         2    4193354     0  /HP5700_LU0
/dev/dsk/dks4d411s7   efs    4659286         2    4193354     0  /HP5700_LU1
/dev/dsk/dks4d412s7   efs    4659286         2    4193354     0  /HP5700_LU2
/dev/dsk/dks4d413s7   efs    4659286         2    4193354     0  /HP5700_LU3
:
```

The default display for drive capacity is 512-byte blocks. To view the capacity of the drives in kilobytes rather than in 512-byte blocks, enter:

df -k

Example

```
# df -k
File system          Type  Kbytes      use      avail  %use Mounted on
/dev/root             xfs   969857    414702    555155    43%  /
/dev/dsk/dks8d0113s0 xfs   1048576        13    1048563     0%  /HP5700-LU00
#
```

To mount and verify the new file systems:

1. Mount all registered file systems; enter:
mount -a
2. To verify the operation of each new file system, go to the mount directory for the file system to be verified.

Example

```
# cd /HP5700_LU0
```

3. Copy any file to the mount directory.

Example

```
# cp /unix.backup1 /HP5700_LU0/unix.back1
```

4. Verify the file copy operation by listing the files in the current directory:

```
# ls -l
```

Example

```
# ls -l
```

```
total 7240
-rwxr-xr-x 1 root sys 3754720 Mar 4 15:08 unix.back1
```

5. Copy the file again to the mount directory, but in this case change the file name to unix.back2.

Example **# cp /unix.backup1 /HP5700_LU0/unix.back2**

6. List the files again to verify the second file copy operation.

Example **# ls -l**

```
-rwxr-xr-x 1 root sys 3754720 Mar 4 15:08 unix.back1
-rwxr-xr-x 1 root sys 3754720 Mar 4 15:08 unix.back2
```

7. Remove the files you copied by entering **rm file_name**.

Example **# rm /HP5700_LU0/unix.back1**
 # rm /HP5700_LU0/unix.back2

8. Repeat steps 2 to 7 for each new file system to be verified.

Troubleshooting

If you encounter an error condition, see [“Error conditions” on page 40](#) for recommended actions.

If you are unable to resolve an error condition, ask your HP support representative for assistance. See [“Calling the HP support center” on page 42](#).

Error conditions

| Error Condition | Recommended Action |
|--|--|
| The logical devices are not recognized by the host. | <p>Verify that the READY indicator lights on the disk array are ON.</p> <p>Verify that fiber cables are correctly installed and firmly connected.</p> <p>Verify that the target IDs are properly configured. The LUNs for each TID must start at 0 and continue sequentially without skipping any numbers.</p> <p>Verify that the TIDs/WWNs on each bus are unique. Do not install two devices with the same ID on the same bus.</p> <p>Recheck the buses for new devices.</p> <p>Verify that LUSE devices are not intermixed with normal LUNs on the same port.</p> <p>Verify that the maximum number of LUSE devices per port has not been exceeded.</p> <p>Verify that the disk array Host Mode is set correctly.</p> |
| The host does not reboot properly after hard shutdown. | <p>If you power off the host without executing the shutdown process, wait three minutes to allow the disk array's internal timeout process to purge queued commands. If the host restarts while the disk array is processing queued commands, the host may not reboot successfully.</p> |
| Physical volumes cannot be created. | <p>Verify that the disk array logical devices are correctly formatted.</p> |
| Logical volumes cannot be created. | <p>Verify that the volume capacity for OPEN-x volumes is not greater than the maximum capacity allowed. See the Device Emulations Appendix.</p> <p>Verify that the capacity of the volume group is not less than the total capacity of the partitioned logical volume.</p> |

| Error Condition | Recommended Action |
|---|---|
| A file system is not mounted after rebooting. | Verify that the host was restarted correctly. Verify that the file system attributes are correct. |
| The disk array performs a self reboot because the disk array was busy or it logged a panic message. | Reboot the host. |
| The disk array responds “Not Ready” or the disk array has displayed “Not Ready” and timed out. | Contact HP. |
| The host detects a parity error. | Check the HBA and make sure it was installed properly. Reboot the host. |
| The host hangs or devices are declared and the host hangs. | Make sure there are no duplicate disk array TIDs and that disk array TIDs do not conflict with any host TIDs. |

Calling the HP support center

If you need to call HP customer support, provide as much information about the problem as possible, including the circumstances of the error or failure and the exact content of any error messages.

Depending on your system configuration, you may be able to view error messages as follows:

- View SIMs in Command View (Device Health tab).
- View R-SIMs in Remote Control XP, including reference codes and severity levels of recent R-SIMs.
- View SIMs that generate SNMP traps on the host.

A

Worksheet

Path worksheet

| LDEV (CU:LDEV) (CU = control unit) | Device Type | SCSI Bus Number | Path 1 | Alternate Paths | | |
|---------------------------------------|----------------|--------------------|--------|-----------------|--------------|--------------|
| 0:00 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:01 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:02 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:03 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:04 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:05 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:06 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:07 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:08 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:09 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:10 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:11 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:12 | | | | TID: LUN: | TID: LUN: | TID: LUN: |
| 0:13 | | | | TID: LUN: | TID: LUN: | TID: LUN: |

Disk array device emulations

This appendix provides information about disk array supported emulations and device type specifications. Some parameters may not be relevant to your array. Consult your HP representative for information about supported configurations for your system.

Supported emulations

| XP Type | Emulation | OPEN-x | LUSE | CVS | LUSE & CVS |
|---------------------------------------|-----------|--------|------|-----|------------|
| XP48 XP512 | OPEN-3 | Yes | Yes | Yes | Yes |
| | OPEN-8 | Yes | Yes | Yes | Yes |
| | OPEN-9 | Yes | Yes | Yes | Yes |
| | OPEN-E | Yes | Yes | Yes | Yes |
| | OPEN-K | Yes | Yes | Yes | Yes |
| | OPEN-L | Yes | Yes | | |
| | OPEN-M | Yes | Yes | | |
| | OPEN-V | | | | |
| XP128 XP1024 XP12000XP 12000 | OPEN-3 | Yes | Yes | Yes | Yes |
| | OPEN-8 | Yes | Yes | Yes | Yes |
| | OPEN-9 | Yes | Yes | Yes | Yes |
| | OPEN-E | Yes | Yes | Yes | Yes |
| | OPEN-K | | | | |
| | OPEN-L | Yes | Yes | | |
| | OPEN-M | | | | |
| | OPEN-V | Yes | Yes | | |

Device type specifications

| Device Type (Note 1) | Category (Note 2) | Blocks (512 bytes) | Sector Size (bytes) | # of Cylinders | Heads | Sectors per Track | Capacity MB* (Note 3) |
|-------------------------|----------------------|-------------------------|---------------------------|-------------------|-------|-------------------------|--------------------------|
| OPEN-3 | SCSI disk | 4806720 | 512 | 3338 | 15 | 96 | 2347 |
| OPEN-8 | SCSI disk | 14351040 | 512 | 9966 | 15 | 96 | 7007 |
| OPEN-9 | SCSI disk | 14423040 | 512 | 10016 | 15 | 96 | 7042 |
| OPEN-E | SCSI disk | 28452960 | 512 | 19759 | 15 | 96 | 13893 |
| OPEN-L | SCSI disk | 71192160 | 512 | 49439 | 15 | 96 | 34761 |
| OPEN-V | SCSI disk | max=125827200 | 512 | Note 5 | 15 | 128 | Note 6 |
| LUSE | | | | | | | |
| OPEN-3*n | SCSI disk | 4806720*n | 512 | 3338*n | 15 | 96 | 2347*n |
| OPEN-8*n | SCSI disk | 14351040*n | 512 | 9966*n | 15 | 96 | 7007*n |
| OPEN-9*n | SCSI disk | 14423040*n | 512 | 10016*n | 15 | 96 | 7042*n |
| OPEN-E*n | SCSI disk | 28452960*n | 512 | 19759*n | 15 | 96 | 13893*n |
| OPEN-L*n | SCSI disk | 71192160*n | 512 | 49439*n | 15 | 96 | 34761*n |
| OPEN-V*n | SCSI disk | max=125827200 Note 4 | 512 | Note 5 | 15 | 128 | Note 6 |
| CVS | | | | | | | |
| OPEN-3 CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-8 CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-9 CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-E CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| CVS LUSE | | | | | | | |
| OPEN-3*n CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-8*n CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-9*n CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-E*n CVS | SCSI disk | Note 4 | 512 | Note 5 | 15 | 96 | Note 6 |
| OPEN-V*n | SCSI disk | Note 4 | 512 | Note 5 | 15 | 128 | Note 6 |

*Capacity = (512 x number of blocks) ÷ 1024²

Note 1: The availability of a disk type depends on the disk array.

Note 2: The devices are defined to the host as SCSI disk devices, even though the interface is Fibre Channel.

Note 3: The device capacity can sometimes be changed by the BIOS or host adapter board. This may make actual capacity different from that listed in the table.

Note 4: The number of blocks for a CVS volume is calculated as follows:
of blocks = (# of cylinders) × (# of heads) × (# of sectors per track)

Example 1: For an OPEN-3 CVS volume with capacity = 37 MB:
of blocks = (53 cylinders—see Note 5) × (15 heads) × (96 sectors per track) = 76320

Example 2: For an OPEN-V CVS volume with capacity = 49 MB:
of blocks = (53 cylinders—see Note 5) × (15 heads) × (128 sectors per track) = 101760

Note 5: The number of cylinders for a CVS volume is calculated as follows
(↑ ...↑ means that the value should be rounded up to the next integer):

OPEN-3/8/9/E: The number of cylinders for a CVS volume =
of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑

Example: For an OPEN-3 CVS volume with capacity = 37 MB:
of cylinders = ↑ 37 × 1024/720 ↑ = ↑ 52.62 ↑ (rounded up to next integer) = 53 cylinders

OPEN-V: The number of cylinders for a CVS volume =
of cylinders = ↑ (capacity (MB) specified by user) × 16/15 ↑

Example: For an OPEN-V CVS volume with capacity = 49 MB:
of cylinders = ↑ 49 × 16/15 ↑ = ↑ 52.26 ↑ (rounded up to next integer) = 53 cylinders

OPEN-3/8/9/E: The number of cylinders for a CVS LUSE volume =
of cylinders = ↑ (capacity (MB) specified by user) × 1024/720 ↑ × n

Example: For a CVS LUSE volume with capacity = 37 MB and $n = 4$
 $\# \text{ of cylinders} = \lceil 37 \times 1024 / 720 \rceil \times 4 = \lceil 52.62 \rceil \times 4 = 53 \times 4 = 212$

OPEN-V: The number of cylinders for a CVS LUSE volume =
 $\# \text{ of cylinders} = \lceil (\text{capacity (MB) specified by user}) \times 16 / 15 \rceil \times n$

Example: For an OPEN-V CVS LUSE volume with capacity = 49 MB and $n = 4$
 $\# \text{ of cylinders} = \lceil 49 \times 16 / 15 \rceil \times 4 = \lceil 52.26 \rceil \times 4 = 53 \times 4 = 212$

Note 6: The capacity of an OPEN-3/8/9/E CVS volume is specified in MB, not number of cylinders. The capacity of an OPEN-V CVS volume can be specified in MB or number of cylinders. You set the volume size using the LUN Configuration Manager or Command View software.

Parameter values tables

The following tables present parameter values for specific Open system types.

Table 1. Value of Parameters for ddr_dbase

| Disk Type | Tag Queue Depth |
|-----------|--|
| OPEN-x | Number of LUNs \times queue depth ≤ 56 and queue depth ≤ 32 |

Table 2. Parameter Values of the OPEN-3 Disk Types

| Parameter | | Disk Type | | | |
|-----------|---|----------------|-------------------------|---|---|
| | | OPEN-3 | OPEN-3*n (n=2 to 36) | OPEN-3 CVS | OPEN-3 CVS*n (n=2 to 36) |
| ty | Disk category | Winchester | Winchester | Winchester | Winchester |
| dt | Control type | SCSI | SCSI | SCSI | SCSI |
| ns | Sectors/tracks | 96 | 96 | 96 | 96 |
| nt | Tracks/cylinder | 15 | 15 | 15 | 15 |
| nc | Number of all cylinders | 3,338 | 3,338*n | Depends on configuration of CV ¹ | Depends on configuration of CV ³ |
| rm | Number of rotations of the disk | 6,300 | 6,300 | 6,300 | 6,300 |
| oa | a partition offset (Starting block in a partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| ob | b partition offset (Starting block in b partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oc | c partition offset (Starting block in c partition) | 0 | 0 | 0 | 0 |
| od | d partition offset (Starting block in d partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oe | e partition offset (Starting block in e partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| of | f partition offset (Starting block in f partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| og | g partition offset (Starting block in g partition) | Set optionally | Set optionally | Set optionally | Set optionally |

Table 2. Parameter Values of the OPEN-3 Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---|-----------------------------|-----------------------------|---|---|
| | | OPEN-3 | OPEN-3*n (n=2 to 36) | OPEN-3 CVS | OPEN-3 CVS*n (n=2 to 36) |
| oh | h partition offset (Starting block in h partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| pa | a partition size | Set optionally ² | Set optionally ² | Set optionally ² | Set optionally ² |
| pb | b partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pc | c partition size | 4,806,720 | 4,806,720*n | Depends on configuration of CV ¹ | Depends on configuration of CV ³ |
| pd | d partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pe | e partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pf | f partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pg | g partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| ph | h partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| ba | a partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bb | b partition block size | 8,192 | 8,192 | 8,192 | Set optionally |
| bc | c partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bd | d partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| be | e partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bf | f partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bg | g partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bh | h partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| fa | a partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fb | b partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fc | c partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fd | d partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fe | e partition fragment size | 1,024 | 1,024 | 1,024 | Set optionally |
| ff | f partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |

Table 2. Parameter Values of the OPEN-3 Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---------------------------|-----------|-------------------------|------------|-----------------------------|
| | | OPEN-3 | OPEN-3*n (n=2 to 36) | OPEN-3 CVS | OPEN-3 CVS*n (n=2 to 36) |
| fg | g partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fh | h partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |

See “Notes for Table 1 Through Table 5” .

Table 3. Parameter Values of the OPEN-8 Disk Types

| Parameter | | Disk Type | | | |
|-----------|---|----------------|-------------------------|---|---|
| | | OPEN-8 | OPEN-8*n (n=2 to 36) | OPEN-8 CVS | OPEN-8 CVS*n (n=2 to 36) |
| ty | Disk category | Winchester | Winchester | Winchester | Winchester |
| dt | Control type | SCSI | SCSI | SCSI | SCSI |
| ns | Sectors/tracks | 96 | 96 | 96 | 116 |
| nt | Tracks/cylinder | 15 | 15 | 15 | Set optionally |
| nc | Number of all cylinders | 9,966 | 9,966*n | Depends on configuration of CV ¹ | Depends on configuration of CV ¹ |
| rm | Number of rotations of the disk | 6,300 | 6,300 | 6,300 | 6,300 |
| oa | a partition offset (Starting block in a partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| ob | b partition offset (Starting block in b partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oc | c partition offset (Starting block in c partition) | 0 | 0 | 0 | 0 |
| od | d partition offset (Starting block in d partition) | Set optionally | Set optionally | Set optionally | Set optionally |

Table 3. Parameter Values of the OPEN-8 Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---|-----------------------------|-----------------------------|---|---|
| | | OPEN-8 | OPEN-8*n (n=2 to 36) | OPEN-8 CVS | OPEN-8 CVS*n (n=2 to 36) |
| oe | e partition offset (Starting block in e partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| of | f partition offset (Starting block in f partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| og | g partition offset (Starting block in g partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oh | h partition offset (Starting block in h partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| pa | a partition size | Set optionally ² | Set optionally ² | Set optionally ² | Set optionally ² |
| pb | b partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pc | c partition size | 14,351,040 | 14,351,040*n | Depends on configuration of CV ¹ | Depends on configuration of CV ¹ |
| pd | d partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pe | e partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pf | f partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pg | g partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| ph | h partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| ba | a partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bb | b partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bc | c partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bd | d partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| be | e partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bf | f partition block size | 8,192 | 8,192 | 8,192 | Set optionally |
| bg | g partition block size | 8,192 | 8,192 | 8,192 | Set optionally |

Table 3. Parameter Values of the OPEN-8 Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---------------------------|-----------|-------------------------|------------|-----------------------------|
| | | OPEN-8 | OPEN-8*n (n=2 to 36) | OPEN-8 CVS | OPEN-8 CVS*n (n=2 to 36) |
| bh | h partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| fa | a partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fb | b partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fc | c partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fd | d partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fe | e partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| ff | f partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fg | g partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fh | h partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |

See “Notes for Table 1 Through Table 5” .

Table 4. Parameter Values of the OPEN-9 Disk Types

| Parameter | | Disk Type | | | |
|-----------|---|----------------|-------------------------|---|---|
| | | OPEN-9 | OPEN-9*n (n=2 to 36) | OPEN-9 CVS | OPEN-9 CVS*n (n=2 to 36) |
| ty | Disk category | Winchester | Winchester | Winchester | Winchester |
| dt | Control type | SCSI | SCSI | SCSI | SCSI |
| ns | Sectors/tracks | 96 | 96 | 96 | 96 |
| nt | Tracks/cylinder | 15 | 15 | 15 | 15 |
| nc | Number of all cylinders | 10,016 | 10,016*n | Depends on configuration of CV ¹ | Depends on configuration of CV ³ |
| rm | Number of rotations of the disk | 6,300 | 6,300 | 6,300 | 6,300 |
| oa | a partition offset (Starting block in a partition) | Set optionally | Set optionally | Set optionally | Set optionally |

Table 4. Parameter Values of the OPEN-9 Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---|-----------------------------|-----------------------------|--|--|
| | | OPEN-9 | OPEN-9*n (n=2 to 36) | OPEN-9 CVS | OPEN-9 CVS*n (n=2 to 36) |
| ob | b partition offset (Starting block in b partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oc | c partition offset (Starting block in c partition) | 0 | 0 | 0 | 0 |
| od | d partition offset (Starting block in d partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oe | e partition offset (Starting block in e partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| of | f partition offset (Starting block in f partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| og | g partition offset (Starting block in g partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| oh | h partition offset (Starting block in h partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| pa | a partition size | Set optionally ² | Set optionally ² | Set optionally ² | Set optionally ² |
| pb | b partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pc | c partition size | 14,423,040 | 14,423,040*n | Depends on configuration of CV ¹ | Depends on configuration of CV ³ |
| pd | d partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pe | e partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pf | f partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| pg | g partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| ph | h partition size | Set optionally | Set optionally | Set optionally | Set optionally |
| ba | a partition block size | 8,192 | 8,192 | 8,192 | 8,192 |

Table 4. Parameter Values of the OPEN-9 Disk Types (Continued)

| Parameter | | Disk Type | | | |
|---|---------------------------|-----------|-------------------------|------------|-----------------------------|
| | | OPEN-9 | OPEN-9*n (n=2 to 36) | OPEN-9 CVS | OPEN-9 CVS*n (n=2 to 36) |
| bb | b partition block size | 8,192 | 8,192 | 8,192 | Set optionally |
| bc | c partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bd | d partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| be | e partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bf | f partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bg | g partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bh | h partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| fa | a partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fb | b partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fc | c partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fd | d partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fe | e partition fragment size | 1,024 | 1,024 | 1,024 | Set optionally |
| ff | f partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fg | g partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fh | h partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| See “Notes for Table 1 Through Table 5” . | | | | | |

Table 5. Parameter Values of the OPEN-K (XP256 only) Disk Types

| Parameter | | Disk Type | | | |
|-----------|----------------|------------|-------------------------|---|-----------------------------|
| | | OPEN-K | OPEN-K*n (n=2 to 36) | OPEN-K CVS | OPEN-K CVS*n (n=2 to 36) |
| ty | Disk category | Winchester | Winchester | Depends on configuration of CV ¹ | Winchester |
| dt | Control type | SCSI | SCSI | Set optionally | SCSI |
| ns | Sectors/tracks | 96 | 96 | Set optionally | 96 |

Table 5. Parameter Values of the OPEN-K (XP256 only) Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---|-----------------------------|-------------------------------|---|---|
| | | OPEN-K | OPEN-K* n ($n=2$ to 36) | OPEN-K CVS | OPEN-K CVS* n ($n=2$ to 36) |
| nt | Tracks/cylinder | 15 | 15 | Set optionally | Set optionally |
| nc | Number of all cylinders | 2,543 | 2,543* n | Set optionally | Depends on configuration of CV ³ |
| rm | Number of rotations of the disk | 6,300 | 6,300 | Set optionally | 6,300 |
| oh | h partition offset (Starting block in h partition) | Set optionally | Set optionally | Set optionally | Set optionally |
| pa | a partition size | Set optionally ² | Set optionally ² | 1,024 | Set optionally ² |
| pb | b partition size | Set optionally | Set optionally | 1,024 | Set optionally |
| pc | c partition size | 3,661,920 | 3,661,920* n | 1,024 | Depends on configuration of CV ³ |
| pd | d partition size | Set optionally | Set optionally | 1,024 | Set optionally |
| pe | e partition size | Set optionally | Set optionally | 1,024 | Set optionally |
| pf | f partition size | Set optionally | Set optionally | 1,024 | Set optionally |
| pg | g partition size | Set optionally | Set optionally | 1,024 | Set optionally |
| ph | h partition size | Set optionally | Set optionally | 1,024 | Set optionally |
| ba | a partition block size | 8,192 | 8,192 | Depends on configuration of CV ¹ | 8,192 |
| bb | b partition block size | 8,192 | 8,192 | Set optionally | 8,192 |
| bc | c partition block size | 8,192 | 8,192 | Set optionally | 8,192 |
| bd | d partition block size | 8,192 | 8,192 | Set optionally | 8,192 |
| be | e partition block size | 8,192 | 8,192 | Set optionally | 8,192 |
| bf | f partition block size | 8,192 | 8,192 | Set optionally | 8,192 |
| bg | g partition block size | 8,192 | 8,192 | 8,192 | 8,192 |
| bh | h partition block size | 8,192 ² | 8,192 | 8,192 | 8,192 |
| fa | a partition fragment size | 1,024 | 1,024 | 8,192 | 1,024 |

Table 5. Parameter Values of the OPEN-K (XP256 only) Disk Types (Continued)

| Parameter | | Disk Type | | | |
|-----------|---------------------------|-----------|-------------------------|------------|-----------------------------|
| | | OPEN-K | OPEN-K*n (n=2 to 36) | OPEN-K CVS | OPEN-K CVS*n (n=2 to 36) |
| fb | b partition fragment size | 1,024 | 1,024 | 8,192 | Set optionally |
| fc | c partition fragment size | 1,024 | 1,024 | 8,192 | 1,024 |
| fd | d partition fragment size | 1,024 | 1,024 | 8,192 | 1,024 |
| fe | e partition fragment size | 1,024 | 1,024 | 8,192 | 1,024 |
| ff | f partition fragment size | 1,024 | 1,024 | 8,192 | 1,024 |
| fg | g partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |
| fh | h partition fragment size | 1,024 | 1,024 | 1,024 | 1,024 |

See “Notes for Table 1 Through Table 5” .

Notes for Table 1 Through Table 5

1. The value of pc is calculated as follows:

$pc = nc * nt * ns$

The nc of OPEN-x CVS corresponds to the capacity specified by SVP or remote console.

The CVS size of OPEN-x is specified by capacity (megabyte), not by number of cylinders.

The number of cylinders of an OPEN-x CVS volume can be obtained by the following calculation (↑ ↑ means round up to integer).

$\text{The number of cylinders} = \uparrow (\text{specified capacity in megabytes from SVP or remote console}) \times 1,024 / 720 \uparrow .$

Example

When 37 MB is specified for an OPEN-3 CVS volume from SVP, the number of cylinders of the OPEN-3 CVS can be calculated as follows:

$37 \times 1,024 / 720 = 52.62$

$\uparrow 52.62 \uparrow = 53$

The OPEN-3 CVS volume has 53 cylinders.

2. The value of pa must be equal to or more than 131,072.

3. The number of cylinders of a Logical Unit Size Expansion (LUSE) composed of OPEN- x CVS volumes corresponds to the capacity specified by the SVP or the remote console. CVS size of OPEN- x is specified by the capacity (megabyte), not by the number of cylinders. The number of cylinders of the OPEN- x CVS volume can be obtained by the following calculation (\uparrow means round up to integer):

The number of cylinders = $\uparrow (\text{specified capacity in megabytes from SVP or remote console} \times 1,024 / 720 \uparrow \times n$

where n is the number of concatenated volumes for LUSE.

Example

When 37 MB is specified for the OPEN-3 CVS volume and the four volumes are concatenated, the number of cylinders of the OPEN-3 CVS can be calculated as follows:

$$\uparrow 37 \times 1,024 / 720 \uparrow \times 4 = \uparrow 52.62 \uparrow \times 4 = 53 \times 4 = 212$$

The LUSE for the OPEN-3 CVS volume has 212 cylinders.

Byte information table

| Category | LU Product Name | Number of Bytes per Inode |
|-------------------------------|------------------------------|---------------------------|
| OPEN-3 | OPEN-3 OPEN-3*2-OPEN-3*28 | 4096 |
| | OPEN-3*29-OPEN-3*36 | 8192 |
| OPEN-8 | OPEN-8 OPEN-8*2-OPEN-8*9 | 4096 |
| | OPEN-8*10-OPEN-8*18 | 8192 |
| | OPEN-8*19-OPEN-8*36 | 16384 |
| OPEN-9 | OPEN-9 OPEN-9*2-OPEN-9*9 | 4096 |
| | OPEN-8*10-OPEN-8*18 | 8192 |
| | OPEN-8*19-OPEN-8*36 | 16384 |
| OPEN-E | OPEN-E | 4096 |
| OPEN- <i>x</i> CVS | OPEN-3 CVS OPEN-9 CVS | 4096 |
| OPEN- <i>x</i> * <i>n</i> CVS | 35-64800 | 4096 |
| | 64801-126000 | 8192 |
| | 126001 and above | 16384 |

Queue depth parameters table

| Type | Parameter Name | Default Value | Required Value for Disk Array |
|---------------|---------------------|----------------------|--|
| SCSI | Read/write time-out | 30 | 60 |
| | Queue depth | 1 | 2 (For LUSE devices use 2 for each LUN. For example, if one LUSE device contains 8 LUNs, use $2 \times 8 = 16$ for the queue depth.) |
| | Queue type | None | Simple |
| Fibre Channel | Read/write timeout | 30 | 60 |
| | Queue depth | Before 52-38-xx | Use 2 if exclusively OPEN-x volumes are mapped to the SCSI/FC port Use 8 if exclusively LUSE volumes are mapped to the SCSI/FC port Use 2 if an intermix of LUSE and OPEN-x volumes is mapped to the SCSI/FC port Use 8 if an intermix of LUSE and OPEN-x volumes is mapped for dummy LU (I-7135-Emu) |
| | | 52-40-xx to 52-44-xx | Number of volumes \times queue-depth ≤ 56 AND queue-depth ≤ 8 |
| | | 52-45-xx or later | Number of volumes \times queue-depth ≤ 56 and queue-depth ≤ 32 |
| | Queue type | None | Simple |

Physical partition size table

| Category | LU Product Name | Physical Partition Size in Megabytes |
|----------|-------------------------|--------------------------------------|
| OPEN-K | OPEN-K | 2 |
| | OPEN-K*2 | 4 |
| | OPEN-K*3 to OPEN-K*4 | 8 |
| | OPEN-K*5 to OPEN-K*9 | 16 |
| | OPEN-K*10 to OPEN-K*18 | 32 |
| | OPEN-K*19 to OPEN-K*36 | 64 |
| OPEN-3 | OPEN-8*2 | 16 |
| | OPEN-8*3 to OPEN-8*4 | 32 |
| | OPEN-8*5 to OPEN-8*9 | 64 |
| | OPEN-3*7-t to OPEN-3*13 | 32 |
| | OPEN-3*14 to OPEN-3*27 | 64 |
| | OPEN-3*28 to OPEN-3*36 | 128 |
| OPEN-8 | OPEN-8 | 8 |
| | OPEN-8*2 | 16 |
| | OPEN-8*3 to OPEN-8*4 | 32 |
| | OPEN-8*5 to OPEN-8*9 | 64 |
| | OPEN-8*10 to OPEN-8*18 | 128 |
| | OPEN-8*19 to OPEN-8*36 | 256 |
| OPEN-9 | OPEN-9 | 8 |
| | OPEN-9*2 | 16 |
| | OPEN-9*3 to OPEN-9*4 | 32 |
| | OPEN-9*5 to OPEN-9*9 | 64 |
| | OPEN-9*10 to OPEN-9*18 | 128 |
| | OPEN-9*19 to OPEN-9*36 | 256 |

| Category | LU Product Name | Physical Partition Size in Megabytes |
|--------------|------------------------|--------------------------------------|
| OPEN-E | OPEN-E | 16 |
| | OPEN-E*2 | 32 |
| | OPEN-E*3 to OPEN-E*4 | 64 |
| | OPEN-E*5 to OPEN-E*9 | 128 |
| | OPEN-E*10 to OPEN-E*18 | 256 |
| OPEN-x*n CVS | 35 to 1800 | 2 |
| | 1801 to 2300 | 4 |
| | 2301 to 7000 | 8 |
| | 7001 to 16200 | 16 |
| | 13201 to 32400 | 32 |
| | 32401 to 64800 | 64 |
| | 64801 to 126000 | 1281 |
| | 126001 on | 256 |

Glossary

| | |
|---------------------------------------|--|
| AL | Arbitrated loop. |
| AL-PA | Arbitrated loop physical address. |
| BC | HP StorageWorks Business Copy XP. BC lets you maintain up to nine local copies of logical volumes on the disk array. |
| CA | HP StorageWorks Continuous Access XP. CA lets you create and maintain duplicate copies of local logical volumes on a remote disk array. |
| Command View | HP StorageWorks Command View XP, a software product for managing XP arrays. Command View runs on a Windows-based management workstation. |
| command device | An LDEV that transfers RAID commands to BC or CA logical volumes. |
| CVS | CVS devices (OPEN-x CVS) are custom volumes that are smaller than normal fixed-sized logical disk devices (volumes). |
| DKC (disk controller unit) | The array cabinet that houses the channel adapters and service processor (SVP). |
| DKU (disk cabinet unit) | The array cabinets that house the disk array physical disks. |
| emulation modes | Emulation modes can be assigned to LDEVs to make them operate like standard OPEN system disk drives. The emulation mode of an LDEV determines its capacity. Refer to the appendices for device capacities. |
| FC | Fibre Channel. |
| FC-AL | Fibre Channel arbitrated loop. |
| FCP | Fibre Channel Protocol. |

| | |
|----------------------------|--|
| HBA | Host bus adapter. |
| HP | Hewlett-Packard Company. |
| LDEV | Logical device. An LDEV is created when a RAID group is divided into sections using a selected host emulation mode (for example, OPEN-9 or OPEN-M). The number of resulting LDEVs depends on the emulation mode. “LDEV” and “volume” are synonyms. |
| LUN | Logical unit number. A LUN results from mapping a SCSI logical unit number, port ID, and LDEV ID to a RAID group. The size of the LUN is determined by the emulation mode of the LDEV and the number of LDEVs associated with the LUN. For example, a LUN associated with two OPEN-3 LDEVs has a size of 4,693 MB. |
| LUSE | Logical Unit Size Expansion, a feature which logically combines LDEVs so they appear as a larger LDEV. This allows a LUN to be associated with 2 to 36 LDEVs. LUSE allows applications to access data requiring large amounts of disk space. |
| OFC | Open Fibre Control. |
| OPEN-x | A general term describing any one of the supported OPEN emulation modes (for example, OPEN-L). |
| OS | Operating system. |
| PA | Physical address. |
| path | “Path” and “LUN” are synonymous. Paths are created by associating a port, a target, and a LUN ID with one or more LDEVs. |
| port | A connector on a channel adapter card in the disk array. A port passes data between the disk array and external devices, such as a host server. Ports are named using a port group and port letter, for example, CL1-A. |
| RAID | Redundant array of independent disks. |
| remote console PC | The PC running HP StorageWorks Remote Control XP. |
| Remote Control (RC) | HP StorageWorks Remote Control XP. A software product used for managing XP arrays. |
| R-SIM | Remote service information message. |

| | |
|-------------|--|
| SCSI | Small computer system interface. |
| SIM | Service information message. |
| SNMP | Simple Network Management Protocol. |
| SVP | Service processor. A notebook computer built into the disk array. The SVP provides a direct interface to the disk array and is used only by the HP service representative. |
| TID | Target ID. |
| VSC | Volume Size Configuration is a feature that defines custom volumes (CVS volumes) that are smaller than normal fixed-sized logical disk devices (volumes). |
| WWN | World Wide Name. A unique identifier assigned to a Fibre Channel device. |

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